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Spruce Budworms Situation in North America 1983

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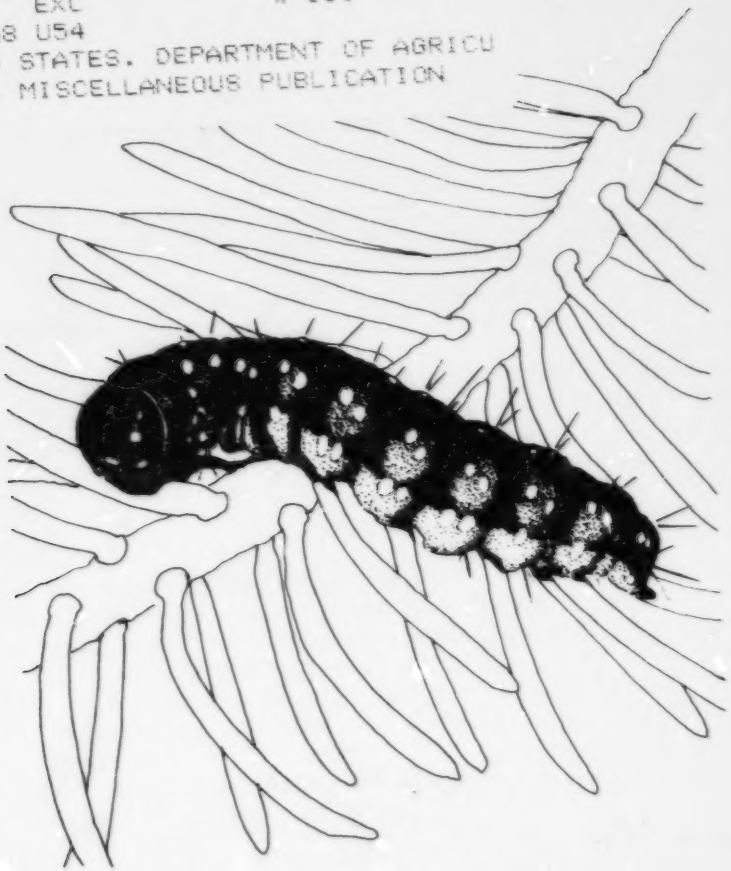

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March 1984

Spruce Budworms Situation in North America 1983

by Daniel R. Kucera[1] and
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In 1983, the spruce budworms continued to have significant impact over large forest areas in North America. In the Eastern United States and eastern Canada, defoliation occurred on more than 26.8 million hectares (ha).[3] In the Western United States and western Canada, defoliation continued to increase and now covers over 4.8 million ha.

Tree mortality continued to increase markedly in the Western United States and in New Hampshire and Vermont. On the Canadian side of the border, tree mortality continued to increase in Nova Scotia and Ontario.

In the Eastern United States and Canada, populations of other insects, such as the four-eyed spruce bark beetle (*Polygraphus rufipennis* (Kirby)), have increased in stands weakened by

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[3] To convert hectares to acres, multiply by 2.5.

prolonged defoliation, thereby adding to the damage. A similar situation is occurring in the Northwestern United States, where the Douglas-fir beetle (*Dendroctonus pseudotsugae* Hopkins) is killing defoliated Douglas-fir.

Balsam fir is the principal host in the Eastern United States and Canada, followed by red spruce, white spruce, black spruce, and eastern hemlock. Significant areas of balsam fir have been killed; red spruce, white spruce, and eastern hemlock are all dying in increasing numbers. In the Western United States and Canada, Douglas-fir is the principal host, along with grand fir, subalpine fir, white fir, and Engelmann spruce.

Aerial treatment operations were carried out on approximately 3.5 million ha in 1983. In Canada, the Provinces of Newfoundland, Nova Scotia, New Brunswick, Quebec, and Ontario carried out treatments. In the United States, cooperative Federal/State efforts took place in New Mexico, Oregon, and Vermont. In Maine, an additional 342,000 ha were treated by the State Bureau of Forestry, and 16,000 ha of Indian reservation lands were treated by the U.S. Department of the Interior. Private landowners in Maine treated another 51,000 ha.

This publication gives information on the spruce budworms situation in 1983, suppression projects undertaken in 1983, and the outlook for 1984 for both Canada and the United States. The Canadian information was provided by the Provincial governments of Newfoundland, Nova Scotia, Prince Edward Island, New Brunswick, Quebec, Ontario, Manitoba, and British Columbia, as well as the Forest Insect and Disease Survey of the Canadian

Forestry Service. The Canadian information was coordinated by the Forest Insect and Disease Survey, Canadian Forestry Service, and, in particular, Edward George Kettela, Maritimes Forest Research Centre, Canadian Forestry Service. The U.S. information was provided by the State governments of Maine, New Hampshire, Vermont, Wisconsin, Minnesota, and Michigan; U.S. Department of Agriculture, Forest Service Regions 1 through 6 and 10; and Northeastern Area, State and Private Forestry, field offices in St. Paul, Minn., and Durham, N.H. The U.S. information was coordinated by the USDA Forest Service.

For further information, contact the USDA Forest Service, Northeastern Area, State and Private Forestry, 370 Reed Road, Broomall, Pa. 19008; or Forest Insect and Disease Survey, Canadian Forestry Service, 19th Floor, Place Vincent Massey, Ottawa, Ontario K1A 1G5.

Situation in 1983

Eastern and Prairie Provinces

Newfoundland—The total area of moderate to severe defoliation caused by the spruce budworm (*Choristoneura fumiferana* (Clemens)) increased from 42,000 ha in 1982 to 67,000 ha in 1983. This increase is small compared to the dramatic decreases in previous years. In stands of merchantable balsam fir and black spruce, which cover an estimated 458,000 ha, volume loss continues to increase. Volume loss in merchantable balsam fir and black spruce now exceeds 25 million cubic meters.[4]

Nova Scotia—The area of moderate to severe defoliation increased from 173,000 ha in 1982 to over 358,000 ha in 1983. The area of dead and dying trees is estimated to be 800,000 ha.

Prince Edward Island—The area of moderate to severe defoliation doubled to 26,000 ha in 1983. The area of dead and dying trees remained stable at about 30,000 ha.

New Brunswick—The area of moderate to severe defoliation increased from 1.2 million ha in 1982 to approximately 2.0 million ha in 1983. In addition, light defoliation occurred on over 301,000 ha. Budworm damage in the current outbreak has killed 6 million cubic meters of softwood trees.

Quebec—The area of moderate to severe defoliation increased from 8.0 million ha in 1982 to 12.3 million ha in 1983. Light defoliation

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[4] To convert meters to cubic feet, multiply by 35.

also occurred on over 946,000 ha. The area within which dead or dying trees occurred remained relatively stable at approximately 12.0 million ha.

Ontario—The area of moderate to severe defoliation increased from 8.0 million ha in 1982 to 9.0 million ha in 1983. Budworm-associated tree mortality also increased in 1983 and now encompasses approximately 12.1 million ha, an increase of some 486,000 ha.

Prairie Provinces—The spruce budworm caused moderate to severe defoliation on over 75,550 ha. Over half of this area was in Manitoba.

Eastern United States

New England—In 1983, the spruce budworm defoliated 2.5 million ha in the New England area, or 536,000 ha less than in 1982. This area included 15,000 ha of Passamaquoddy and Penobscot Indian lands in Maine.

The total area defoliated in Maine decreased somewhat. Maine recorded 2.4 million ha of defoliation.

In New Hampshire, the area defoliated continued to decline, and over 9,000 ha of spruce-fir have been harvested by large industrial landowners in the past 5 years.

In Vermont, the total area defoliated increased slightly. Vermont recorded 72,000 ha of defoliation; tree mortality occurred on over 46,000 ha. Timber loss in Vermont now exceeds $4 million per year.

Lake States--Defoliation by spruce budworm in Michigan, Minnesota, and Wisconsin increased slightly. Defoliation occurred on about 25 percent of the spruce-fir type. Spruce budworm populations are increasing, but much of the defoliation is visible only from the ground and is not recorded during aerial surveys.

Nearly 1.2 million cubic meters, or 486,000 cords, of spruce-fir were killed on National Forest System lands in the Lake States between 1977 and 1982. Dead timber was salvaged where accessibility, harvest regulations, and markets permitted. The harvest of dead and dying timber has reduced losses significantly. Although about half the spruce-fir volume in attacked stands remains alive, this residual volume is now being defoliated by spruce budworm.

In Minnesota between 1977 and 1982, the budworm killed about 1.2 million cubic meters, or 501,000 cords, of white spruce and balsam fir on 75,000 ha. This loss equates to 16 cubic meters per ha, or 20 percent of the available balsam fir volume. White spruce losses were negligible; black spruce losses were not detected.

Western Provinces

British Columbia—The area of Douglas-fir defoliated by the western spruce budworm (*Choristoneura occidentalis* Freeman) increased to 74,000 ha. In this area, 19,000 ha were classified as moderate and severe defoliation. Only 25 ha contained dead and dying trees.

The western spruce budworm and the 2-year budworm (*Choristoneura biennis* Freeman) caused defoliation of alpine fir and white spruce on over 166,000 ha in the Prince Rupert, Prince George, Cariboo, and Nelson regions in British Columbia. About 2,500 ha contained dead and dying trees.

Western United States

For the second year in a row, budworm activity increased in extent and intensity. Defoliation increased markedly in Oregon, California, Utah, Wyoming, Idaho, and Montana. Forest Service Regions recorded the following defoliation.

Northern Region (R-1)—The western spruce budworm outbreak areas again increased in 1983. Buildups in 1982 and 1983 follow a 4-year decline (1978-81). Budworm defoliation during 1983 was recorded on 1.0 million ha.

Defoliation increased in Yellowstone National Park and on the Beaverhead, Custer, Gallatin, Helena, Lewis and Clark, and Lolo National Forests in Montana. The largest increase occurred on the Gallatin National Forest, where defoliation rose from 133,000 ha in 1982 to 253,000 ha in 1983. Declines, however, occurred on the Bitterroot and Flathead National Forests.

Defoliation in Montana is expected to remain static in 1984; in northern Idaho, a moderate increase is likely.

Rocky Mountain Region (R-2)—Defoliation increased from 810,000 ha in 1982 to 1.1 million ha in 1983. Most of the defoliation occurred in Colorado on the Front Range and on the San Juan National Forest.

Defoliation, which occurred in mixed conifer stands, was generally moderate throughout the infested area. Approximately 15 percent of the infested area had some mortality, especially in the northern part of the Colorado Front Range.

Defoliation within the currently infested area is expected to remain at similar levels in 1984.

Southwestern Region (R-3)—Since 1975, the western spruce budworm has been building to outbreak levels throughout most of the mixed conifer host type in Arizona and New Mexico. Visible defoliation of current year's growth remained relatively unchanged, decreasing slightly from 141,000 ha in 1982 to 140,000 ha in 1983.

The most extensive defoliation occurred in New Mexico on the Carson, Santa Fe, and Lincoln National Forests and on the Mescalero Apache Indian Reservation. Less extensive defoliation was also observed in New Mexico on the Cibola and Gila National Forests and in Arizona on the Kaibab National Forest and Grand Canyon National Park, as well as on several other Federal and nonindustrial private ownerships scattered throughout the region. Although some mortality has occurred as a result of several years of consecutive defoliation, specific data on these losses are not available.

Defoliation within currently infested areas is expected to continue at similar levels in 1984.

Intermountain Region (R-4)—Defoliation increased in Utah, Wyoming, and southern Idaho. Defoliated acres increased from 1.0 million ha in 1982 to 1.1 million ha in 1983. In southern

Idaho, the western spruce budworm defoliated 966,000 ha of Douglas-fir, subalpine fir, and grand fir. In Utah and Wyoming, 166,000 ha of Douglas-fir, subalpine fir, and white fir were defoliated.

Defoliation increased on the Boise, Bridger-Teton, Challis, Dixie, Manti-LaSal, Payette, and Salmon National Forests. The greatest expansion occurred on the Boise, Bridger-Teton, Manti-LaSal, and Payette National Forests. Most of the defoliated area was classified as moderate to heavy.

Pacific Southwest Region (R-5)—Another budworm, *Choristoneura carnana californica* Powell, defoliated Douglas-fir in Trinity and Shasta Counties in California. Defoliation expanded from 2,200 ha in 1982 to 42,000 ha in 1983.

Pacific Northwest Region (R-6)—The area of defoliation increased from 609,000 ha in 1982 to 1.0 million ha in 1983.

In northern Oregon, budworm defoliation was detected on the Mount Hood National Forest in areas where it had not been found since 1952. Defoliation was observed from the ground on the Deschutes National Forest, southwest of Bend. Western spruce budworm populations continue to increase on the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests. Every National Forest in eastern Oregon currently has a spruce budworm outbreak.

In southern Oregon, defoliation caused by the Modoc budworm (*Choristoneura viridis* Freeman) increased on the Fremont and Winema National Forests. True firs were most heavily defoliated. Defoliation increased from 2,000 ha in 1982 to

to 51,000 ha in 1983. Surveys conducted this fall indicate that defoliation will continue in 1984.

In Washington, the size of the budworm infestation on the Okanogan National Forest and adjacent State and private lands increased in 1983. Surveys conducted this fall suggest that populations are increasing in newly infested areas and that defoliation continues to occur in currently infested areas.

Alaska Region (R-10)—In Alaska, ground surveys indicated a substantial increase in *Choristoneura orae* Freeman populations on white spruce in the Copper Center area. At least 500 ha have been defoliated along the Edgerton highway.

Pheromone trapping studies have detected moderate numbers of budworm on both Sitka and white spruce from Anchorage to the Kenai Peninsula and in the Haines and Juneau areas of southeast Alaska.

Budworm life history and pheromone studies continued throughout 1983. These studies—conducted cooperatively by the Institute of Northern Forestry at Fairbanks, the Canadian Forestry Service, and the USDA Forest Service—support the opinion that *Choristoneura orae* is the budworm species in south-central Alaska. Further studies, however, are needed to delineate the range of this new species in southeast and interior Alaska.

Summary of Suppression Projects

Eastern Provinces

Newfoundland—The Department of Forest Resources and Lands treated 73,400 ha with aminocarb in 1983.

Nova Scotia—The Department of Lands and Forests treated 21,000 ha with *Bacillus thuringiensis* (Bt).

New Brunswick—Forest Protection Limited treated 1.5 million ha. Aminocarb was used on 101,000 ha; Bt was used on 10,300 ha. The balance was treated with fenitrothion.

Quebec—The Department of Natural Resources treated 1.3 million ha with aminocarb, fenitrothion, and Bt.

Ontario—The Ministry of Natural Resources treated 3,500 ha in the Hearst District. This area included commercial forest, Provincial parks, plantations, and a "moose yard." Most of the area (89 percent) was treated with Bt; the remainder was treated with aminocarb.

Eastern United States

New England States—Vermont's first recorded spruce budworm suppression project took place June 1-3, when 700 ha were treated in Orleans and Caledonia Counties. Bt was applied to protect small, privately owned, high-hazard spruce-fir woodlots. The objective--to protect at least 40 percent of the foliage--was achieved in all of the 32 spray blocks.

The Maine Forest Service spruce budworm suppression program involved four insecticides: aminocarb, acephate, carbaryl, and the biological

insecticide Bt. A total of 342,665 ha were treated in 1983. About 256,000 ha were treated with aminocarb, 36,000 ha with carbaryl, 2,000 ha with acephate, and 48,000 ha with Bt. Foliage protection was satisfactory with all insecticides except aminocarb. The results with aminocarb ranged from very good to unacceptable. The greatest inconsistencies seemed to occur in those treatment blocks where large aircraft were used.

The Passamaquoddy Tribe in Maine treated approximately 16,200 ha with Bt. The major objective was met: to protect 991,200 cubic meters of spruce, fir, and hemlock stands. Defoliation in treated stands was negligible.

In addition, International Paper Company treated 42,000 ha in northern Maine with aminocarb, mexacarbate, and Bt. J. D. Irving Company sprayed 8,100 ha in northern Maine with aminocarb. And the town of Garfield treated 405 ha with Bt.

Western Provinces

No suppression projects were conducted in western Canada.

Western United States

Southwestern Region—For the second consecutive year, a western spruce budworm suppression project was conducted on the western half of the Carson National Forest. Approximately 15,000 ha were treated. Preliminary results indicate the unadjusted budworm mortality in treated areas averaged 86 percent for carbaryl and 75 percent for Bt.

Pacific Northwest Region—In 1983, 212,000 ha were treated: 203,000 ha were treated with carbaryl, 4,000 ha with mexacarbate, and 5,000 ha with Bt. To prepare for 1984, an environmental analysis is being made to evaluate the current situation.

Outlook for 1984

Canada

In most of eastern Canada, the infested areas are expected to decrease. Newfoundland and Nova Scotia are predicting decreases to 43,000 ha and 200,000 ha, respectively. New Brunswick is also predicting a decrease.

Quebec is predicting a slight increase. Ontario and Prince Edward Island are predicting large increases to 12.0 million ha and 100,000 ha, respectively.

The Prairie Provinces are expecting a slight increase in the area and intensity of defoliation.

In British Columbia, western spruce budworm defoliation will remain light.

United States

In the Lake States, defoliation is expected to increase in Michigan, Minnesota, and Wisconsin. This increase began in 1983, following a 6-year decline. Populations of spruce budworm, the area of defoliation, and intensity of defoliation are expected to increase. Nearly half the spruce and fir remains alive and will be susceptible to future attacks.

In Maine, the defoliated area is expected to be somewhat lower than in 1983, and fewer high-hazard areas are expected to need protection. A concerted targeted suppression and targeted harvesting objective apparently had a positive effect in reducing losses. Still, 1.2 million ha will contain trees in extreme to high-hazard

condition. An estimated 203,000 to 405,000 ha will probably be treated in 1984.

Current defoliation on Penobscot Tribal holdings in Maine covers 5,909 ha; defoliation on Passamaquoddy lands covers 8,711 ha. In 1984, the Passamaquoddy Tribe proposes to treat 12,150 ha; the Penobscot Tribe 4,050 ha.

The defoliation forecast for Vermont shows that overall defoliation damage should be similar to or less than in 1983. Tree mortality, however, is expected to continue on over 46,000 ha in the northeast corner of the State. A suppression project is planned for 1984, but fewer areas are being considered for treatment than in 1983.

In New Hampshire, spruce budworm populations are expected to remain at low levels. Nevertheless, trees continue to die on approximately 12,500 ha.

Outbreaks will continue in many of the Western States. Defoliation is expected to increase in Alaska, Utah, Wyoming, northern and southern Idaho, and northern California.

Although conditions are expected to remain static in Oregon and Montana, the outbreaks in these States continue unabated. Every National Forest in eastern Oregon currently has a spruce budworm outbreak.

In Washington, an increase is anticipated on the Okanogan National Forest.

Marked tree mortality is expected to continue in Arizona, Colorado, New Mexico, Montana, Oregon, and Wyoming. Suppression projects are anticipated in Oregon and New Mexico in 1984. Even though suppression projects will reduce losses, tree mortality will continue in areas not receiving protection or where accessibility and markets preclude salvage operations.

Tables

Table 1--Summary of 1983 spruce budworm defoliation, tree mortality, suppression, and forecast for 1984, Eastern United States and Canada

Province or State	1983			Forecast for 1984
	Area of visible defoliation	Area with dead and dying trees	Area treated	
	1,000 hectares			
Newfoundland	67	458	73	43 -[1]
Nova Scotia	358	800	21	200 -
Prince Edward Island	26	30	0	100 +[2]
New Brunswick	2,329	1,000	1,495	-
Quebec	12,266	11,964	1,254	13,000 +
Ontario	9,033	12,119	4	12,000 +
Prairie Provinces	76	0	0	+
Eastern Canada	24,155	26,371	2,847	NA[3]
Maine	2,430	122	410[4]	1,200 -
New Hampshire	2	12	0	1 -
Vermont	72	46	1	65 -
Michigan	60	--[5]	0	17 +
Minnesota	51	--	0	56 +
Wisconsin	9	--	0	77 +
Eastern United States	2,624	180	411	NA
Total	26,779	26,551	3,258	NA

[1] - = decrease in defoliation.
[2] + = increase in defoliation.
[3] NA = not applicable.
[4] Includes State of Maine project and also other landowners.
[5] -- = Area of dead or dying trees not determined.

Table 2--Summary of 1983 western spruce budworm[1] defoliation, tree mortality, suppression, and forecast for 1984, Western United States and Canada

Province or Forest Service Region (States)	1983			Forecast for 1984
	Area of visible defoliation	Dead and dying trees reported	Area treated	
	1,000 hectares			
British Columbia	239	3	0	+[2]
Northern Region (Mont., northern Idaho, northwestern Wyo.)	1,059	456	0	Static
Rocky Mountain Region (Colo., Wyo.)	1,100	165	0	Static
Southwestern Region (Ariz., N. Mex.)	140	--[3]	15	Static
Intermountain Region (Utah, Nev., central Idaho, Wyo.)	1,127	--	0	Static
Pacific Southwest Region (Calif.)	42	0	0	+
Pacific Northwest Region (Oreg., Wash.)	1,047	209	212	+
Alaska Region	1	0	0	+
Total	4,755	833	227	NA[4]

[1] Table also includes defoliation by C. viridis in southern Oregon; C. carnana californica in northern California; C. orae in southern Alaska; and C. biennis in British Columbia.

[2] + = increase in defoliation.

[3] -- = Area of dead and dying trees not determined.

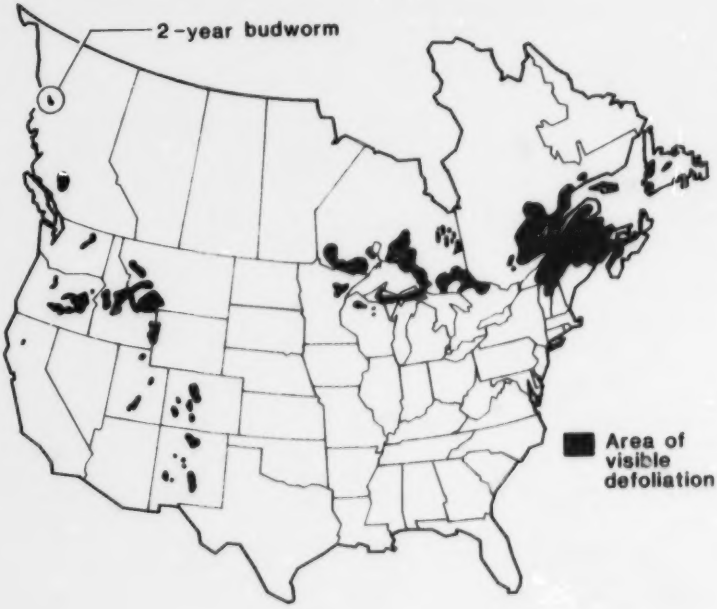
[4] NA = not applicable.

Table 3--Trend of defoliation caused by spruce budworms (*Choristoneura* spp.) in North America

Province, State, or Forest Service Region	1982	1983	Trend in 1983
	1,000 hectares		
Newfoundland	42	67	25 +[1]
Nova Scotia	173	358	185 +
Prince Edward Island	13	26	13 +
New Brunswick	1,202	2,329	1,127 +
Quebec	8,000[2]	12,266	4,266 +
Ontario	8,023	9,033	1,010 +
Prairie Provinces	5	76	71 +
Eastern Canada	17,458	24,155	NA[3]
Maine	2,976	2,430	546 -[4]
New Hampshire	16	2	14 -
Vermont	60	72	12 +
Michigan	47	60	13 +
Minnesota	51	51	0 +
Wisconsin	1	9	8 +
Eastern United States	3,151	2,624	NA
British Columbia	107	239	132 +
Western Canada	107	239	NA
Northern Region	914	1,059	145 +
Rocky Mountain Region	810	1,100	290 +
Southwestern Region	141	140	1 -
Intermountain Region	1,013	1,127	114 +
Pacific Southwest Region	2	42	40 +
Pacific Northwest Region	609	1,047	438 +
Alaska Region	0	1	1 +
Western United States	3,489	4,516	NA
Total	24,205	31,534	NA

[1] + = increase in defoliation.
[2] This figure includes an estimate of areas of dead trees as well as areas of defoliation.
[3] NA = not applicable.
[4] - = decrease in defoliation.

Spruce Budworms Defoliation, 1983



Spray Treatment Areas, 1983

The use of company names in this publication is for the reader's information. Such use does not constitute an cfficial endorsement by the U.S. Department of Agriculture of any product or service by a company.

Update to "Spruce Budworms Situation in North America 1982"

Page 8, Southwestern Region. 138,000 ha should be changed to 141,000 ha. This figure should also be changed on page 18, table 2, and on page page 19, table 3.

Page 17, Table 1. The area of visible defoliation for New Hampshire (column 1) should be changed from 4 to 16. This figure should also be changed on page 19, table 3; this correction then changes the number "13 -" (column 3, trend in 1983) to 1 -.

This publication reports the use of pesticides in both Canada and the United States. It does not contain recommendations for their use. All uses of pesticides must be registered by appropriate Canadian or U.S. agencies before they can be recommended for use in either country.

CAUTION: Pesticides can be injurious to human beings, animals, desirable plants, fish, or other wildlife--if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.